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ABSTRACT

This document presents information on most of the known insecticides and their general usage, toxicity, formulation, compound type, manufacturers, and the chemical, trade and common names applied to each compound. (CS)

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Insecticide Compendium

MP 29

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INSECTICIDE COMPENDIUM

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Insecticide Compendium

Introduction

This compendium presents information on most of the known insecticides. This is not a list of recommended products nor is it to be used in determining what insecticide to use to control a particular pest. Pesticides are under constant review and subject to change in approved uses.

The increasing number of insecticides, and brand names makes it very difficult for one to know about all products. Often the names of insecticides are very confusing. Official recommendations prepared by the Wyoming Agricultural Cooperative Extension Service and the Agriculture Experiment Station use the common names of pesticides officially accepted by the Federal Environmental Protection Agency (EPA). Proprietary name(s) are often given in parenthese immediately after the common name, e.g., carbaryl (Sevin). A proprietary name for an insecticide is one used by a company having exclusive right to manufacture and sale. Sometimes these proprietary or trade names are given as Sevin®. In some cases, common names may not have been established or approved, in which case the proprietary name is used.

We have included below an explanation of the information given in brief form on the accompanying sheets which will assist the reader in interpreting the material presented.

A. Common name: Becomes official when adopted by the American National Standards Institute, or by the Interdepartmental Committee on Pest Control.

B. Chemical names: Appear long and complicated to the layman but are logical and precise and have a world wide meaning while trade names and common names may not be well known or accepted.

C. Manufacturer: Usually this is the company which manufactures the basic or technical product.

D. Type compound:

(1) Chlorinated hydrocarbons: Synthetic organic insecticides containing a combined chlorine, especially those with chlorine making up a major portion (50% or more) of the molecular weight of a compound. Noted for their residual activity. Generally not good for mite control. Examples: DDT, lindane, chlordane, dieldrin, aldrin, methoxychlor and endrin.

(2) Carbamates: Esters of carbamic acid, both contact and systemic compounds for uses on livestock and plants to control sucking and chewing insects as well as snails, millipedes, and spider mites. Very good for caterpillar control. Examples: carbaryl (Sevin), aldicarb (Temik), carbofuran (Furadan), and Baygon.

(3) Organophosphorus: Insecticides containing phosphorus, generally short term residual, both contact and systemic, compounds; good for both sucking and chewing insects on livestock and plants. Low to high toxicity. Some show excellent fly control. Examples: dimethoate (Cygon Defend), dichlorvos (DDVP), Meta-Systox-R, malathion, Baytex, Abate, azinphosmethyl (Guthion), Ciodrin, diazinon, coumaphos (CoRal), crufomate (Ruelene), disulfoton (Di-Syston), Dyfonate, famphur (Warbex),

Gardona, Rabon, naled (Dibrom), phorate (Thimet), ronnel (Korlan), tepp (TEPP), and trichlorfon (Dylox).

(4) Fumigants: Any material exerting toxic action in its gaseous state. They are toxic to warm-blooded animals, some are extremely toxic and should be handled only by an experienced operator. Examples: carbon disulfide, carbon tetrachloride, ethylene dibromide, hydrogen cyanide (HCN), methyl bromide, paradichlorobenzene (PDB).

(5) Systemic insecticides: Those that have the ability to be translocated to other parts of a plant or animal than those to which the material is applied.

E. Formulations:

(1) Dusts: Dry insecticides are mixed with finely ground diluent. The diluents are usually talc, pyrophylite, clays, diatomaceous earth and others. They are normally ready to use.

(2) Wettable Powders (WP): A powder containing a wetting agent that will cause the product to be suspended in water for use as a spray material. Sometimes a spreader-sticker is added to aid in spreading the spray over the plant and causing the insecticide residue to adhere to its surface.

(3) Emulsifiable concentrates (EC): These are produced by dissolving the toxicant and emulsifying agent in an organic solvent. A solvent substantially insoluble in water is usually selected since water-miscible solvents have not in general proved feasible. Recommended dosages usually are given in terms of volume rather than by weight, as with wettable powders. These have a

tendency to cause more plant injury at high temperature than other formulations.

(4) Soluble Powders (SP): They are similar to wettable powders except that the particles are completely dissolved in water rather than going into suspension. They will not settle out once dissolved.

(5) Granules (G): These contain the insecticide and a carrier or diluent. The insecticide is impregnated upon carrier granules the size of sand particles or larger.

(6) Oil Soluble: Oil soluble concentrates are similar to the emulsifiable concentrates except they will not mix with water but can be mixed with suitable oil.

(7) Flowables (F): A creamy formulation that can be mixed readily with water to form a suitable suspension.

(8) Fumigants: Any material exerting toxic action in its gaseous state.

(9) Oil Base Sprays: Contain an active ingredient dissolved in a solvent ready to use, cannot be mixed with water. Concentration of pesticide is usually low.

(10) Miscible Superior Oil (sprayable oils): Primarily used as a dormant spray for home grounds use. These oils contain an emulsifier; they are to be mixed with water before spraying. May cause injury to evergreens. Dormant sprays are not recommended in Wyoming.

(11) Ultra Low Volume (ULV): Spraying method of applying low quantity of a chemical usually without the use of a carrier.

The term on a label signifies that the total volume of spray to be applied per acre is 1/2 gallon or less. Only a limited number of chemicals are cleared for ULV application.

F. Compatibility:

The ability of two or more substances to mix without objectionable changes in their physical or chemical properties.

G. Toxicity:

Is defined as the degree to which a substance is poisonous. The toxicity of insecticides is determined by performing tests on laboratory animals (rats, rabbits, and/or guinea pigs). From these tests, estimates can be made as to how hazardous the tested compound would be by comparing it with others. Keep in mind there may be a difference of susceptibility to the insecticide between test animals and humans, therefore, the toxicity rating is considered for comparative purposes. An acute oral toxicity rating for each insecticide is given as well as some dermal toxicity ratings. These ratings are expressed as LD_{50} which is a statistical estimate of the dosage necessary to kill 50% of a population of test animals. The lower the LD member, the more toxic the compound, thus an LD value of 6 indicates a much more toxic compound than an LD value of 1500.

H. General usage:

We have tried to give a broad description of the pesticide here whether an insecticide, or miticide, etc.

The insecticides are arranged in alphabetical order by

common name or by trade name. An index is provided for further assistance in finding a product.

Insecticide trade names or trade marks are used in an attempt to identify a specific product or a line of products by a certain company. Some examples of these are: Pests' Best, Black Leaf, Black Flag, Control, Isotox, Raid, Acme, DePester, and Pulvex. Labels must give the well known or official common name of an insecticide in the list of active ingredients if such a name is available. When these common names are not available, the chemical designation is given.

ORAL, DERMAL AND INHALATION RATINGS OF PESTICIDE GROUPS

EPA Category-Meaning	Pesticide Label Signal Word*	Oral LD_{50} (mg/kg)	Dermal LD_{50} (mg/kg)	Inhalation LC_{50}** ($\mu g/l$)	Lethal Oral Dose For A 150 lb Man
I. Highly Hazardous	Danger Poison	0-50	0-200	0-2,000	few drops to teaspoonful
II. Moderately Hazardous	Warning	50-500	200-2,000	2,000-20,000	teaspoonful to one ounce
III. Slightly Hazardous	Caution	500-5,000	2,000-20,000	over 20,000	one ounce to one pint or pound
IV. Relatively Non-Hazardous	Caution	over 5,000	over 20,000	-----	over one pint or pound

* All pesticide labels carry a "Keep Out of Reach of Children" warning.
** Vapor or gas inhalation value may also be expressed in parts per million (ppm).

III-(I)-7

Abate

COMMON NAME

TRADE NAMES: Abate, Bayothion

CHEMICAL NAME: O,O,O',O'-Tetramethyl O,O'-thiodi-p-phenylene phosphorothioate

MANUFACTURED BY: American Cyanamid

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate, granules, and water dispersable powder.

TOXICITY: Acute oral LD_{50} of tech. Abate* (rat), 8600 mg/kg
Acute dermal LD_{50} (rabbit), greater than 4000 mg/kg.

GENERAL USE: Insecticide, effective as a mosquito and midge larvicide.

REMARKS:

COMMON NAME: acephate

TRADE NAMES: Orthene

CHEMICAL NAME: O,S-Dimethyl acetylphosphoramidothioate

MANUFACTURED BY: Chevron Chemical Co.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Wettable powder, soluble powder, pressurized sprays, and granules.

TOXICITY: Acute oral LD_{50} (male rats), 945 mg/kg
Acute oral LD_{50} (female rat), 866 mg/kg
Acute dermal LD_{50} (rabbits), greater than 10,250 mg/kg

GENERAL USE: Systemic insecticide. Effective against aphids, cankerworms, tent caterpillars, leaf miners, leaf rollers, leafhoppers, thrips on ornamentals.

REMARKS: Low phytotoxicity.

COMMON NAME: aldicarb

TRADE NAMES: Temik

CHEMICAL NAME: 2-methyl-2 (methylthio)propionaldehyde
O-(methylcarbamoyl) oxime

MANUFACTURED BY: Union Carbide Corporation, Agricultural Products

TYPE COMPOUND: Carbamate

FORMULATIONS: Granules 10%; wettable powder, 50%.

TOXICITY: Acute oral LD_{50} (female rat), 0.93 mg/kg (tech.)
Acute dermal LD_{50} (rabbit), 5.0 mg/kg (tech.)
Acute oral LD_{50} (rat), 7.0 mg/kg (Temik 10G)
Acute dermal LD_{50} (rat) dry, 2500-6000 mg/kg (Temik 10G)

GENERAL USE: Systemic insecticide, acaricide and nematocide for soil use. Accepted for use to control certain pests on potatoes, sugar beets, commercial grain, and ornamentals.

REMARKS:

COMMON NAME: aldrin

TRADE NAMES: aldrin; Aldrosol; Aldrite; Drinox; Octalene; Seedrin.

CHEMICAL NAME: not less than 95% of 1, 2, 3, 4, 10, 10-hexachloro-1, 4, 4a, 5, 8, 8a-hexahydro-1.4-endo-exo-5,8-dimethanonapthalene

MANUFACTURED BY: Shell Chemical Company
Shell International Chemical Co.

TYPE COMPOUND: chlorinated hydrocarbon

FORMULATIONS: dusts & dust concentrates, emulsifiable concentrate, wettable powders, oil solutions & granules

TOXICITY: Acute oral LD_{50} (rats), 55mg/kg
Acute dermal LD_{50} (rats), 200mg/kg
No phytotoxicity with proper formulation
Greatest occupational hazard is skin absorption

GENERAL USE: aldrin is used primarily to control soil insects, turf pests, corn rootworms, wireworms, white grubs & many other insects.

REMARKS: No harmful effects have been noted on soil microorganisms & no off-flavor in plants grown on soils treated with recommended dosages of aldrin.

COMMON NAME: allethrin, pallethrine (France)

TRADE NAMES: Pynamin

CHEMICAL NAME: 2-allyl-4-hydroxy-3-methyl-2-cyclopenten-1-one ester of 2,2-dimethyl-3-(2-methylpropenyl)-cyclopropane-carboxylic acid

MANUFACTURED BY: FMC: MGK Co.; Stauffer Chemical Co.; Sumitomo Chemical Co., Ltd. (Japan)

TYPE COMPOUND: A synthetic product similar to one of the components found in pyrethrum

FORMULATIONS: Formulated in aerosols, oil sprays and dusts with or without a synergist such as MGK 264 for use in the household.

TOXICITY: Low order of toxicity to mammals. Exempt from tolerances on agricultural crops.

GENERAL USE: Insecticide used as stock spray, space spray, stored grain vegetable and fruit spray. Widely used in aerosols. Used also as dip for injured fruits and vegetables.

REMARKS: Rapid action against insects.

Aramite

COMMON NAME:

TRADE NAME: Aramite; Aracide; Niagaramite

CHEMICAL NAME: 2-(p-tert-butylphenoxy)-1-methylethyl 2-chlorcethyl sulfite

MANUFACTURED BY: UniRoyal Chemical

TYPE COMPOUND: Aryl alkyl sulfite

FORMULATIONS: Product discontinued

TOXICITY: Acute oral LD_{50} (rat), 6,300 mg/kg

GENERAL USE: Miticide. Ornamentals, fruit, vegetables (not on edible parts.)

REMARKS: Product discontinued.

COMMON NAME: azinphosmethyl

TRADE NAMES: Guthion; Carfene; Gusathion

CHEMICAL NAME: O,O-dimethyl S(4-oxo-1, 2, 3-benzotriazin-3 (4H)-ylmethyl) phosphorodithioate

MANUFACTURED BY: Chemagro Div.; Baychem Corp.; FFB AG (West Germany)

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Wettable powder, emulsifiable concentrates

TOXICITY: Acute oral LD_{50} (rat), about 15 mg tech./kg
Acute dermal LD_{50} (rat), 220 mg/kg

GENERAL USE: Insecticide, approved for a broad spectrum of insects on alfalfa, fruit, vegetables, melon crops as well as ornamentals, forest and shade trees.

REMARKS: One of the more persistent phosphates, low water solubility. Vapor and dermal hazards probably less than parathion.

Bacillus thuringiensis

COMMON NAME: Bacillus thuringiensis

TRADE NAMES: Thuricide; Thuricide 90 TS; Agritol; Bakthane; Biotrol; Dipel; Larvatrol; Tribactur

CHEMICAL NAME: Bacillus thuringiensis Berliner

MANUFACTURED BY: IMC Corp, Crop Aid Products, Dept.; Abbott Laboratories, Agricultural and Veterinary Products, Div.; Nutrilite Products, Inc. (Biotrol distributed through Thompson-Hayward Chemical Co.; in Europe under the name Tribactur)

TYPE COMPOUND: Microbial insecticide

FORMULATIONS: Stabilized suspension, wettable powder, dust, and bait.

TOXICITY: Harmless to humans and animals.

GENERAL USE: Specific for larval stages of lepidopterous insects. Useful for control of various lepidopterous pests in tobacco, vegetables, and forested areas.

REMARKS:

COMMON NAME: benzene hexachloride

TRADE NAMES: BHC, Benzahex, Benzex, Dol, Dolmix, FBHC, Hexafor, Soprocide

CHEMICAL NAME: 1,2,3,4,5,6-hexachlorocyclohexane, mixed isomers and a specified percentage of gamma

MANUFACTURED BY: Hooker Chemical Corp; Klipfontein Organic Products Corp., Ltd. (Rep. South Africa); Nippon Soda Co. Ltd., Fine Chemicals Div. (Japan) Shing Nung Chemical Co., Ltd. (Taiwan)

TYPE COMPOUND: Chlorinated hydrocarbon

FORMULATIONS: Dusts, wettable powders, oil solutions

TOXICITY: Acute oral LD_{50} (rat) 600 mg/kg

GENERAL USAGE: Insecticide of limited current use. BHC formulations should not be applied to food crops near harvest and never to soil where root crops might absorb the off-flavor.

REMARKS:

COMMON NAME:

TRADE NAMES: Bux

CHEMICAL NAME: m-(ethylpropyl) phenyl methylcarbamate mixture (ratio 1:3) with m-(1-methylbutyl)-phenyl methylcarbamate

MANUFACTURED BY: Chevron Chemical Co., Ortho Div.

TYPE COMPOUND: Carbamate

FORMULATIONS: Granules and emulsifiable concentrate

TOXICITY: Acute oral LD_{50} (rat), 170 mg/kg
Acute dermal LD_{50} (rat), 242 mg/kg

GENERAL USE: Insecticide effective against larvae of corn rootworm.

REMARKS:

Calcium Cyanide

COMMON NAME: Calcium Cyanide

TRADE NAMES: Cyanogas

CHEMICAL NAME: $Ca(CN)_2$

MANUFACTURED BY: American Cyanamid Co.

TYPE COMPOUND: Cyamide
Action: fumigant

FORMULATIONS: Granular or dust (42%)

TOXICITY:

GENERAL USAGE: For control of insect and rodent pests in flour mills, seed houses, grain elevators; in city and state public health programs for rat control; fumigation of greenhouses and mushroom houses.

REMARKS:

COMMON NAME: carbaryl

TRADE NAMES: Sevin, Hexavin, Karbaspray, Ravyon, Septene, Tricarna

CHEMICAL NAME: 1-naphthyl methylcarbamate

MANUFACTURED BY: Union Carbide Corp., Agricultural Products; Makhteshim Beer - Sheba Chemical Works, Ltd. (Israel)

TYPE COMPOUND: Carbamate

FORMULATIONS: Wettable powder, dusts, granules, baits, flowable

TOXICITY: Acute oral LD_{50} (rat), 500 mg/kg
Acute dermal LD_{50}, > 4000 mg/kg

GENERAL USE: A broad spectrum insecticide for use on field, forage, rangeland, vegetable crops, livestock and poultry.

REMARKS: One of the safer insecticides to animals but highly toxic to bees.

COMMON NAME: carbofuran

TRADE NAMES: Furadan

CHEMICAL NAME: 2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate

MANUFACTURED BY: FMC Corp., Niagara Chemical Div.; Chemagro

TYPE COMPOUND: Carbamate

FORMULATIONS: Granules (2, 3, and 10%); Flowable (4 lb/gal), wettable powder 75%.

TOXICITY: Acute oral LD_{50}, 11 mg/kg
Acute dermal LD_{50}, 10,200 mg/kg.

GENERAL USE: Insecticide, nematocide and miticide registered for use on field corn to control corn rootworm and on alfalfa to control weevil larvae and lygus bugs.

REMARKS: Do not move bees into or near treated alfalfa field for 7 days.

COMMON NAME: carbon disulfide

TRADE NAMES:

CHEMICAL NAME: Carbon disulfide (also carbon bisulfide)

MANUFACTURED BY: Stauffer, FMC Corp., Inorganic Chemical Div., PPG Industries Inc.

TYPE COMPOUND: Fumigant

FORMULATIONS: Used alone; emulsions or solutions with alkali (thiocarbonates). For grain fumigation, admixture with carbon tetrachloride.

TOXICITY: Acute vapor toxicity, 200 ppm

GENERAL USE: Used for fumigation of stored grain, nursery stock and soil. Not approved for fumigation of beans, cowpeas or peas.

REMARKS:

COMMON NAME: carbon tetrachloride

TRADE NAMES:

CHEMICAL NAME: Carbon tetrachloride, CCl_4

MANUFACTURED BY: The Dow Chemical Co.; FMC Corp. Inorganic Chemicals Div.; PPG Industries, Inc., Chemical Div.; Stauffer Chemical Co.; Vulcan Materials Co., Chemicals Div.

TYPE COMPOUND: Fumigant

FORMULATIONS:

TOXICITY: Acute oral LD_{50} (rat), 7500 mg/kg.
Acute vapor toxicity, 300 ppm.

GENERAL USE: Used to reduce fire hazard in combination with either carbon disulfide or ethylene dichloride intended as grain fumigants. These mixtures are not approved for fumigation of dry beans, peanuts or peas.

REMARKS:

COMMON NAME: carbophenothion

TRADE NAMES: Garrathion; Trithion; Dagadip

CHEMICAL NAME: S-((p-Chlorophenylthio)methyl) O,O-diethyl phosphorodithioate

MANUFACTURED BY: Stauffer Chemical Company

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate, wettable powder, dust and granules.

TOXICITY: Acute oral LD_{50} (rat), 32.2 mg/kg.
Acute dermal LD_{50} (rat), 54 mg/kg.

GENERAL USE: An insecticide-acaracide useful on a wide range of fruit, vegetable and fiber crops. Particularly effective as an acaricide; long residual action.

REMARKS:

COMMON NAME: chlordane

TRADE NAMES: Aspon, Belt, Chlor Kil, Chlorodane, Kypchlor, Octachlor, Ortho-Klor, Synklor, Topiclor 20, Velsicol 1068

CHEMICAL NAME: 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4, 7-methanoindane

MANUFACTURED BY: Velsicol Chemical Corporation

TYPE COMPOUND: Chlorinated hydrocarbon

FORMULATIONS: Granules, dusts, wettable powder, emulsifiable concentrates, and oil solutions.

TOXICITY: Acute oral LD_{50} (rat), 457-590 mg/kg.
Acute dermal LD_{50} (rat), 840 mg/kg.

GENERAL USE: Insecticide for control of soil insects, preplanting or seedbed treatments. For pests of turf, ants, wood-boring insects including dairy and poultry houses. Of limited household use.

REMARKS:

COMMON NAME: chlorobenzilate

TRADE NAMES: Acaraben; Acar; Benzilan; Folbex; Kop-Mite.

CHEMICAL NAME: ethyl 4,4'-dichlorobenzilate

MANUFACTURED BY: CIBA-Geigy Corp. (Agricultural Div.); Agon Chemical Manufacturers Ltd. (Israel); Makhteshim Beer-Sheba Chemical Works Ltd. (Israel).

TYPE COMPOUND: Chlorinated hydrocarbon

FORMULATIONS: Emulsifiable Concentrate

TOXICITY: Acute oral LD_{50} (rat), 960 (tech.) mg/kg.
Relatively low level of toxicity to warm blooded animals.

GENERAL USE: Acaracide. Used on a variety of agricultural and horticultural crops for control of many species of mites.

REMARKS:

COMMON NAME: chlorpyrifos

TRADE NAMES: Dursban

CHEMICAL NAME: O,O-diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate

MANUFACTURED BY: The Dow Chemical Co.

TYPE COMPOUND: organophosphorus

FORMULATIONS: Emulsifiable concentrates (2 lbs & 4 lbs/gal) & granulars.

TOXICITY: Acute oral LD_{50} (rat), 163mg/kg
Acute oral LD_{50} (guinea pig) 500mg/kg
Acute oral LD_{50} (rabbit) 1000-2000mg/kg

GENERAL USAGE: A broad spectrum insecticide for control of turf pests, ornamental plant pests, household and premise pests, mosquitoes (adults and larvae); approved for use in meat and poultry plants under USDA inspection programs.

REMARKS:

COMMON NAME: coumaphos

TRADE NAMES: Co-Ral, Asuntol, Baymix, Meldane, Muscatox, Resistox.

CHEMICAL NAME: O,O-diethyl O-(3-chloro-4-methyl-2-oxo(2H)-1-benzopyran-7-yl) phosphorothioate

MANUFACTURED BY: Chemagro Corp.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: 25% wettable powder, 4% pour-on, (1 lb/gal). Emulsifiable concentrate; dusts 5%, 1% and 0.5%; 2% Feed Premix.

TOXICITY: Acute oral LD_{50} (rat), 56-230 mg. tech./kg
Acute dermal LD_{50}, 860 mg/kg.

GENERAL USE: An animal systemic insecticide used for control of many parasites of livestock, internal as well as external.

REMARKS:

COMMON NAME: creosote oil

TRADE NAMES: Creosote oil

CHEMICAL NAME: creosote

MANUFACTURED BY: Allied Chemical Company, Semet Solvay Div.; Crowley Tar Products Co., Koppers Co. Inc., Organic Materials Div., U. S. Steel Corp. Chemicals Div. Witco Chemical Corp., Pioneer Div.

TYPE COMPOUND: Tar oils - essentially aromatic hydrocarbons but contain small amounts of derivatives soluble in aqueous alkali, and nitrogenous compounds.

FORMULATIONS: Miscible concentrates; stock emulsions (concentrated paste-like emulsions) (Both are generally diluted with water).

TOXICITY: May, cause dermatitis under influence of sunlight

GENERAL USAGE: High toxicity to eggs of insects such as aphids and psyllids; applied to fruit trees to control overwintering egg.

REMARKS:

COMMON NAME: crotoxyphos

TRADE NAMES: Ciodrin

CHEMICAL NAME: α- methylbenzyl 3-hydroxycrotonate dimethyl phosphate

MANUFACTURED BY: Shell Chemical Company; Shell International Chemical Company

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate, dilute oil solutions and dusts.

TOXICITY: Acute oral LD_{50} (rat), 125 mg/kg
Acute dermal LD_{50} (rabbit), 385 mg/kg.

GENERAL USE: Used for control of numerous external pests of livestock.

REMARKS:

COMMON NAME: crufomate

TRADE NAMES: Ruelene

CHEMICAL NAME: 4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate

MANUFACTURED BY: Dow Chemical Company

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Sold as emulsifiable concentrate, pour-on, or solution.

TOXICITY: Acute oral LD_{50}, 635 mg/kg.

GENERAL USE: Mainly for control of cattle grubs, lice and horn cattle.

REMARKS: Not for use on lactating animals.

DBCP

COMMON NAME: (DBCP)

TRADE NAMES: Nemagon; Fumazone; Nemafume

CHEMICAL NAME: 1,2-dibromo-3-chloropropane

MANUFACTURED BY: The Dow Chemical Co.; Shell Chemical Co.; Shell International Chemical Co.

TYPE COMPOUND: Halogenated hydrocarbon

FORMULATIONS: Emulsifiable and non-emulsifiable concentrates

TOXICITY: Acute oral LD_{50} (male rat) approximatley 173 mg/kg
Acute dermal LD_{50} (rabbit) approximately 1420 mg/kg
Acute vapor toxicity, 368 ppm, 1- hr exposure
103 ppm, 8- hr exposure

GENERAL USAGE: A soil fumigant for nematode control. Used on a variety of crops including cotton, fruits, nuts, vegetables, and ornamentals.

REMARKS:

DDT

COMMON NAME: DDT, Chlorophenothane

TRADE NAMES: Topocide, Anofex, Dedelo, Genitox, Gesapon, Gesarex, Gesarol, Gyron, Ixodex, Kopsol, Neocid, Pentachlorin, Rukseam, Zerdane

CHEMICAL NAME: Dichloro-diphenyltrichloroethane

MANUFACTURED BY: Allied Chemical Corp.; Diamond Chemicals de Mexico (Mexico); Guanor y Fertilizantes, S.A. (Mexico); Hindustan Insecticides Ltd. (India); Montrose Chemical Corp. of California; Nippon Soda Co., Ltd.; Fine Chemicals Div. (Japan); Rumianca S.A. (Italy); Societe d'Electro-Chimie d'Ugine (France)

TYPE COMPOUND: Chlorinated hydrocarbon

FORMULATIONS: A contact poison, it is formulated in aerosols, dusts, solutions, wettable powders, and emulsifiable concentrates.

TOXICITY: The acute oral toxicity for man has been established at 250 mg/kg.
Acute oral LD_{50} (rat) for technical DDT, 113 mg/kg.
Acute dermal LD_{50} (rat), 2,510 mg/kg.

GENERAL USE: DDT has no general usage in the U. S. at present. Chlorophenothane registered for use against human crab lice, scabies and head lice.

REMARKS:

COMMON NAME: demeton

TRADE NAMES: Systox, Systemox

CHEMICAL NAME: O,O-diethyl O (and S)-2-(ethylthio)ethyl phophorothioates

MANUFACTURED BY: Chemagro Division, Baychem Corp.; Farbenfabriken Bayer AG (Germany)

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrates

TOXICITY: Acute oral LD_{50} (rat), 4-12 mg tech/kg

GENERAL USE: Systemic insecticide-acaracide. Approved for use in control of certain sucking insects and mites on alfalfa, clover, small grains, sugar beets, fruits, ornamentals and vegetables.

REMARKS:

COMMON NAME: diazinon

TRADE NAME: Diazinon, Basudin, Diazajet, Diazide, Diazol, Dazzel, Gardentox, Spectracide

CHEMICAL NAME: O,O-diethyl O-(2-isopropyl-4-methyl-6-pyrimidyl) phosphorothioate

MANUFACTURED BY: CIBA-Geigy Corp., Agricultural Div.
Makhteshim Beer-Sheba Chemical Works, Ltd. (Israel)

TYPE COMPOUND: organophosphorus

FORMULATIONS: Wettable powder, emulsifiable, oil solutions and granules

TOXICITY: Acute oral LD_{50} (rat) 466 ± 87 mg/kg
Acute dermal LD_{50} (rat) 900 mg/kg

GENERAL USE: Used in controlling blowfly strike in sheep. For control of soil insects, such as corn rootworm, wireworms, and cabbage maggot. Also effective against many pests of fruits, vegetables, forage, field crops and ornamentals, and household insects. Used for control of insect pests of sheep.

REMARKS: Cannot be used on poultry farms due to toxicity to birds

COMMON NAME: dichlorvos

TRADE NAMES: Vapona, DDVP; Dedevap, Divipan, Herkol, Mafu, Marvex, Nogos, No-Pest, Navan, Oko, Phosvit, Equigard, Task, and Atgard

CHEMICAL NAME: 2,2-dichlorovinyl O, O-dimethyl phosphate

MANUFACTURED BY: Shell Chemical Co; Shell International Chemical Co.; Nippon Soda Co., Fine Chemicals Div. (Japan); Farbenfabriken Bayer AG (West Germany); Makhteshim Beer-Sheba Chemical Works, Ltd. (Israel)

TYPE COMPOUND: Organophosphorus

FROMULATIONS: Emulsifiable concentrates, oil-base concentrates, ready-to-use-sprays, space sprays, resin strips, flea collars, and baits.

TOXICITY: Acute oral LD_{50} (rat), 80mg/kg
Acute dermal LD_{50} (male rat) 107mg/kg

GENERAL USAGE: A contact and stomach poison, it acts also as a fumigant. Controls horn flies, houseflies, face flies, stable flies, gnats, and mosquitoes on lactating dairy animals and beef cattle. Formulated as an antihelminthic for swine, horses, and dogs.

REMARKS:

COMMON NAME: dicofol

TRADE NAMES: Kelthane, Acarin, Mitigan

CHEMICAL NAME: 1,1-bix(chlorophenyl)-2,2,2-trichloro ethanol.

MANUFACTURED BY: Rohm & Haas Co.

TYPE COMPOUND: chlorinated hydrocarbon

FORMULATIONS: Wettable powder and emulsifiable concentrate.

TOXICITY: Acute oral LD_{50} (rat) 809mg/kg
Acute dermal LD_{50} (rat) 1,230mg/kg

GENERAL USAGE: Acaricide used on many fruit, vegetable, ornamental, and field crops for the control of various species of mites.

REMARKS:

dieldrin

COMMON NAME: dieldrin

TRADE NAMES: Albit, Dieldrite, Octalox, Panoram D-31

CHEMICAL NAME: not less than 85% of 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8a-octahydro-1,4-endo-exo-5,8-dimethanonaphthalene

MANUFACTURED BY: Shell Chemical Co.; Shell International Chemical Co.

TYPE COMPOUND: chlorinated hydrocarbon

FORMULATIONS: Wettable powders, emulsifiable concentrates, dusts, granules, fertilizier mixtures, seed dressings, solutions.

TOXICITY: Acute oral LD_{50} (rat), 60mg/kg
Acute dermal LD_{50} (rat), 100mg/kg

GENERAL USAGE: A contact and stomach insecticide that does not provide a quick kill but does offer excellent residual activity. It is used for control of soil insects, household and public health insects, thrips, ants, termites, cutworms, crickets, armyworms, grasshoppers, white grubs, plant bugs and many other pests.

REMARKS:

COMMON NAME: dimethoate

TRADE NAMES: Cygon, Defend, Daphene, Dimethogens, Fostion MM, Perfekthion, Rebelate, Rogor, Roxion, Trimetion.

CHEMICAL NAME: O,O-dimethyl S-(N-methylcarbamoylmethyl) phosphorodithioate

MANUFACTURED BY: American Cyanimid Co.; Badische Anilin- & Soda Fabrik AG (West Germany); Sumitomo Chemical Co. Ltd. (Japan); BASF Wyandotte Corp. Celamerck GmbH & Co., KG (West Germany); Farbenfabriken Bayer AG (West Germany); Montecatini Edison S.p.A. (Italy)

TYPE COMPOUND: organophosphorus

FORMULATIONS: Emulsifiable concentrate, ULV concentrate, wettable powder, granules, dust.

TOXICITY: Acute oral LD_{50} (male albino rat), 320-380mg/kg
Acute dermal LD_{50} (rat) 610mg/kg
Acute dermal LD_{50} (guinea pig), 650mg/kg

GENERAL USAGE: A systemic insecticide-acaricide used as a residual wall spray in farm buildings for controlling house flies, a wide range of insects and mites on ornamental plants, many vegetables, sorghum, alfalfa, watermelons, apples, pears, safflower, wheat, and melons.

REMARKS:

COMMON NAME: dioxathion

TRADE NAMES: Delnav, Hercules AC 528, Navadel, Ruphos

CHEMICAL NAME: 2,3-p-Dioxanedithiol s,s-bis-(O,O-drethylphosphorodithipate)

MANUFACTURED BY: Hercules Incorporated

TYPE COMPOUND: organophosphorus

FORMULATIONS: Available as a 47% emulsifiable concentrate (plant application), & as 15% & 30% emulsifiable livestock formulations.

TOXICITY: Acute oral LD_{50} (male rat), 110mg/kg
Acute dermal LD_{50} (rat), 235mg/kg

GENERAL USAGE: An insecticide-miticide for the control of ticks, lice, horn fly, and sheep ked on cattle, goats, sheep and hogs as a spray or dip. Also for control of mites on cotton, grapes, citrus, ornamentals, apples, pears and quinces.

REMARKS:

disulfoton

COMMON NAME: disulfoton

TRADE NAMES: Di-Syston, Frumin Al, Solvirex

CHEMICAL NAME: O,O-diethyl S-(2-[(ethylthio)ethyl]) phosphorodithioate

MANUFACTURED BY: Chemagro Division, Baychem Corp.; Farbenfabriken Bayer AG (West Germany); Sandoz Ltd. (Switzerland)

TYPE COMPOUND: organophorphorus

FORMULATIONS: Granules, liquid concentrate, impregnated on fertilizer, seed treatment powder.

TOXICITY: Acute oral LD_{50} (rat), 12.5mg/kg
Acute dermal LD_{50} (rat), 20mg/kg

GENERAL USAGE: A systemic insecticide-acaricide soil application as a systemic to certain crops and ornamentals. Particularly effective against sucking insects.

REMARKS: Because of high toxicity should be used only by professional operators.

Dyfonate

COMMON NAME:

TRADE NAMES: Dyfonate

CHEMICAL NAME: O-ethyl-S-phenylethylphosphonodithioate

MANUFACTURED BY: Stauffer Chemical Co.

TYPE COMPOUND: organophosphorus

FORMULATIONS: Granules 20 or 10%; emulsifiable concentrate (4 lb/gal)

TOXICITY: Acute oral LD_{50} (male rat), 8-17.5mg/kg (tech. mat.)
Acute dermal LD_{50} (rabbit), 25mg/kg

GENERAL USAGE: An insecticide for control of corn rootworms, wireworms, cutworms, symphylans (garden centipedes), and other soil insects.

REMARKS: Granular formulations are much less hazardous than emulsions.

COMMON NAME: endosulfan

TRADE NAMES: Thiodan, Cyclodan, Hoe2671, Insectophene, Kop-Thiodan; Malix, Thifor, Thimul, Thionex

CHEMICAL NAME: 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3,-benzodioxathiepin-3-oxide

MANUFACTURED BY: FMC Corp., Niagara Chemical Div.; Farbwerke Hoechst AG (West Germany); Makhteshim Beer-Sheba Chemical Works Ltd. (Israel)

TYPE COMPOUND: chlorinated hydrocarbon

FORMULATIONS: Wettable powder; dusts; emulsifiable concentrate granules 3%.

TOXICITY: Acute oral LD_{50} (rat), 30 mg/kg in alcohol suspension
70 mg/kg in aqueous suspension; 110 mg/kg in oil
Acute dermal LD_{50} (rat) 130 mg/kg
Toxic to fish

GENERAL USAGE: Controls aphids, thrips, beetles, foliage feeding larvae, mites, borers, cutworms, bugs, whiteflies, leafhoppers, and slugs on deciduous trees, small fruits, as well as vegetables and forage.

REMARKS: May lead to milk contamination if treated crop remnants are fed.

COMMON NAME: endrin

TRADE NAMES:

CHEMICAL NAME: 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-endo-5,8-dimethanonaphthalene

MANUFACTURED BY: Shell Chemical Co.; Shell International Chemical Co.; Velsicol Chemical Corp.

TYPE COMPOUND: chlorinated hydrocarbon

FORMULATIONS: Emulsifiable concentrate

TOXICITY: Acute oral LD_{50} (female rat), 5 mg/kg; (male rat), 45 mg/kg
Acute dermal LD_{50} (female rat), 60 mg/kg; (male rat), 120 mg/kg

GENERAL USAGE: Used for control of insects on field crops such as cutworms, armyworms, aphids, corn borer, cabbage looper, grasshoppers, plant bugs, lygus bugs, webworms and others. Also for control of mice in orchards.

REMARKS: One of the most poisonous of chlorinated hydrocarbons. Should be used only when there are no alternatives. A number of the uses have been cancelled in the U.S.

COMMON NAME: EPN

TRADE NAMES: EPN

CHEMICAL NAME: O-ethyl O-p-nitrophenyl phenylphosphonothioate

MANUFACTURED BY: DuPont; Nissan Chemical Industries, Ltd. (Japan); Sumitomo Chemical Co., Ltd. (Japan)

TYPE COMPOUND: Organophorphorus

FORMULATIONS: Wettable powders, granules, emulsifiable concentrate

TOXICITY: Acute oral LD_{50} (male rat), 42 mg/kg; (female rat), 14 mg/kg
Acute dermal LD_{50} (rat) 230 mg/kg
Toxic to bees; poisoned bees may endanger whole brood.

GENERAL USAGE: Insecticide and acaricide for control of certain mites and insects, including European corn borer and corn rootworm adults.

REMARKS: Extremely hazardous by skin contact, inhalation, or swallowing. Use on McIntosh and other apple varieties may result in some injury to the plant.

ethion

COMMON NAME: ethion

TRADE NAMES: Ethodan; Kwit

CHEMICAL NAME: O,O,O',O'-tetraethyl S,S'-methylenebisphosphorodithioate

MANUFACTURED BY: FMC Corp., Niagara Chemical Co.

TYPE COMPOUND: organophorphorus

FORMULATIONS: Wettable powder 25%; dusts 2%, 3% and 4%; emulsifiable concentrates; granules 5%, various oil solutions.

TOXICITY: Acute oral LD_{50} (rat), 65 mg/kg
Acute oral LD_{50} (rat), (pure) 208 mg/kg; (tech.) 96 mg/kg
Acute dermal LD_{50} (rat), 245 mg/kg

GENERAL USAGE: Insecticide and acaricide for control of aphids, mites (including Eriophyid mites), scales, thrips, leafhoppers, maggots, and foliar feeding larvae, on a wide variety of food, fiber and ornamental crops.

REMARKS:

COMMON NAME: ethylene dibromide

TRADE NAMES: Dowfume W-85, Bromofume, Kopfume, Nephis, Pestmaster, Soilbrom - 86

CHEMICAL NAME: 1,2-dibromoethane

MANUFACTURED BY: Dow Chemical Company

TYPE COMPOUND: Fumigant

FORMULATIONS: In inert solvent or in mixture with carbon tetrachloride.

TOXICITY: Acute oral LD_{50} (rat), 146 mg/kg
Acute vapor toxicity, 200 ppm.

GENERAL USE: Fumigant, insecticide, nematocide. In solution in inert solvent for soil (Dowfume W-85). In mixture with carbon tetrachloride for mills and warehouses (83%).

REMARKS: If confined to the skin, will cause severe burning. Phytoxocity can be avoided by a delay in planting for 1 to 3 weeks after soil fumigation.

COMMON NAME: ethylene dichloride

TRADE NAMES:

CHEMICAL NAME: 1,2-dichloroethane

MANUFACTURED BY: Diamond Shamrock Chemical Company

TYPE COMPOUND: Fumigant

FORMULATIONS: For fumigation, ethylene dichloride is usually mixed in a 3 to 1 proportion with carbon tetrachloride to avoid flammability.

TOXICITY: Acute oral LD_{50} (rat), 670-890 mg/kg;
Acute vapor toxicity, 1000 ppm.

GENERAL USE: Insect fumigant, used in fumigation of stored products against insects. An emulsion is mixed with water and poured on soil at the base of peach trees to control borers.

REMARKS: It is somewhat flammable. It should not be used on foods with a high fat content which might retain a disagreeable odor and taste.

COMMON NAME: ethylene oxide

TRADE NAME:

CHEMICAL NAME: 1,2-epoxyethane

MANUFACTURED BY: Dow Chemical Company; Jefferson Chemical Co., Inc.; Union Carbide Corp., Linde Div.; BASF Wyandotte Corp., Industrial Chemicals Group

TYPE COMPOUND: Fumigant

FORMULATIONS: Ethylene oxide itself is sold in pressure cylinders and drums. Mixture with carbon dioxide improves killing properties as well as reducing flammability of the gas.

TOXICITY: Acute vapor toxicity, 500 ppm.

GENERAL USE: Used principally for the treatment of stored products in fumigation chambers.

REMARKS: Highly reactive and flammable. Effective at low temperatures because of low boiling point. Lower dosages may be used and quicker kills obtained through stimulation of the insect respiration with carbon dioxide mixed with the ethylene oxide.

COMMON NAME: fensulfothion

TRADE NAMES: Dasanit, Terracur P

CHEMICAL NAME: O,O-diethyl O-[p-(methylsulfinyl)phenyl] phosphorothioate

MANUFACTURED BY: Chemagro Division, Baychem Corp.
Farbenfahriken Bayer AG(Germany)

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate (6 lb/gal.); 15% granular

TOXICITY: Acute oral LD_{50} (rat), 2-10mg/kg. Highly toxic; rapidly absorbed through skin

GENERAL USAGE: Nematicide-insecticide for control of certain soil insects such as wireworms, maggots, corn rootworm tuber flea beetle, sugar beet root maggot.

REMARKS: For use by commercial growers and applicators.

heptachlor

COMMON NAME: heptachlor

TRADE NAMES: Drinox H-34; Heptamul

CHEMICAL NAME: 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene

MANUFACTURED BY: Velsicol Chemical Corp.

TYPE COMPOUND: chlorinated hydrocarbon

FORMULATIONS: Dust, dust concentrate, emulsifiable concentrate, wettable powder, oil solution

TOXICITY: Acute oral LD_{50} (rat), 100 mg/kg
Acute dermal LD_{50} (rat), 195mg/kg

GENERAL USAGE: For control of soil insects, such as wireworms, non-resistant corn rootworm, white grubs, and cutworms in corn, small grains, various fruits and vegetables, and other crops; also for turf insect and termite control.

REMARKS: Phased out of current recommendations because of its long persistence and production of toxic epoxide.

Imidan, Prolate

COMMON NAME:

TRADE NAMES: Imidan (for plants), Prolate, GX-118 (for livestock)

CHEMICAL NAME: O,O-dimethyl S-phthalimidomethyl phosphorodithioate

MANUFACTURED BY: Stauffer Chemical Co.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Wettable Powder 50%, pour-on

TOXICITY: Acute oral LD_{50} (rat) 216 mg/kg

GENERAL USE: Insecticide-acaracide for control of numerous pests of crops and ornamental plants, e.g., alfalfa weevil larvae, codling moth, etc. Prolate is a systemic animal insecticide effective against cattle grubs.

REMARKS:

COMMON NAME: lead arsenate

TRADE NAMES: Soprabel

CHEMICAL NAME: Acid orthoarsenate, $PbHAsO_4$ also basic orthoarsenate, $Pb_4 (PbOH) (AsO_4)_3$

MANUFACTURED BY: Chevron Chemical Co., Ortho Div.; FMC Corp., Niagara Chemical Div.; Los Angeles Chemical Col; Nihon Nohyaka Co., Ltd. (Japan); Procida (Groupe Roussel-Uclaf-France) Rhodia Inc.; Chipman Div. Woolfolk Chemical Works.

TYPE COMPOUND: arsenical

FORMULATIONS:

TOXICITY: Lethal dose in man, 10-50 mg/kg
Acute oral LD_{50} (rat) 1,050 mg/kg
Acute dermal LD_{50} (rat) 72,400 mg/kg

GENERAL USAGE: A standard insecticide. Acid lead arsenate has had extensive use in the control of fruit insects, especially on apple and other orchards. Basic lead arsenate had limited application, as on peach or other fruits in moist climates where the less stable acid form caused leaf burn.

REMARKS:

lethane 384

COMMON NAME:

TRADE NAMES: Lethane 384

CHEMICAL NAME: b-Butoxy-b'-thiocyanodiethyl ether

MANUFACTURED BY: Rohm & Haas Co.

TYPE COMPOUND: thiocyanate
Action: insecticide

FORMULATIONS: 80% concentrate; 53% solution

TOXICITY: Acute oral LD50 (rat), 90 mg/kg

GENERAL USAGE: Used as a contact insecticide and knock down agent in mosquito control and household and industrial sprays.

REMARKS:

malathion

COMMON NAME: malathion; mercaptothion, carbofos

TRADE NAMES: Cythion; Malathon; Emmatos; Emmatos Extra; Korbofos; Kop-Thion; Kypfos; Malaspray; Malamar; Zithiol

CHEMICAL NAME: O,O-dimethyl S-(1,2-dicarbethoxyethyl)phosphorodithionate

MANUFACTURED BY: American Cyanamide Co.; Agricola Chemicals Limited (Great Britian); Cheminova (Denmark); Excel Industries Limited (India); Snia Viscosa S.p.A. (Italy; Sumitomo Chemical Co., Ltd. (Japan)

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate, wettable powder, dust

TOXICITY: Acute oral LD_{50} (rat), 1,375 mg/kg
Acute dermal LD_{50} (rabbit), 4,100 mg/kg

GENERAL USAGE: Controls a wide variety of insects including aphids, spider mites, scale insects, house fly, and mosquitoes as well as large number of sucking and chewing insects of livestock, poultry, fruits, vegetables, and ornamentals.

REMARKS: Very little hazard when used as directed.

Mesurol

COMMON NAME:

TRADE NAMES: Mesurol, Mercaptodimethur, Methiocarb, Metmercapturon

CHEMICAL NAME: 4-(Methylthio-3,5-xylyl methylcarbamate

MANUFACTURED BY: Chemagro, Division of Baychem Corp.

TYPE COMPOUND: Carbamate

FORMULATIONS: Bait

TOXICITY: (tech.) Acute oral LD_{50} (rat), 130 mg/kg
Dermal LD_{50}, 350-400 mg/kg
Inhalation LC50 about 2100 mg/l

GENERAL USAGE: Molluscicide. For control of slugs and snails around the home, flower gardens, and ornamental greenhouses.

REMARKS: Do not use around food crops.

COMMON NAME: metaldehyde

TRADE NAMES: Antimilace

CHEMICAL NAME: Polymer of acetaldehyde; or metacetaldehyde (tech. 99.0% min.)

MANUFACTURED BY: Commercial Solvents Corp.

TYPE COMPOUND: Molluscicide

FORMULATIONS: Bait, dusts, wettable powders, concentrated aqueous suspensions.

TOXICITY: Acute oral LD_{50} (rat), 630 mg/kg
Acute oral LD_{50} (dog), 250-1000 mg/kg

GENERAL USE: A component of slug and snail baits that acts as attractant and also as toxicant. It may be formulated with or without calcium arsenate.

REMARKS: Avoid contamination of foliage or edible parts of plants.

COMMON NAME: methamidophos (proposed)

TRADE NAMES: Monitor, Tamaron

CHEMICAL NAME: O,S.-Dimethyl phosphoramidothioate

MANUFACTURED BY: Chevron Chemical Co., Ortho Div.; Farbenfabriken Bayer AG (Germany)

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate, wettable powder, granule and ULV concentrate.

TOXICITY: Acute oral LD_{50} (female rat), 18.9 mg/kg; (male rat), 21.0 mg/kg

GENERAL USE: Insecticide for certain sucking and chewing insects on potatoes and other vegetable and field crops. Effective against aphids, mites, leafhoppers, flea beetles and many species of lepidopterous larvae.

REMARKS: Active as a contact and residual insecticide-acaricide. Shows systemic activity by basal or trunk application to deciduous trees. No phytotoxicity observed on vegetable or field crops, but defoliation has occurred when applied as a foliar spray to deciduous trees. Harmful to bees.

COMMON NAME: methoxychlor

TRADE NAMES: Marlate (also a component of Alfa-Tox), Moxie

CHEMICAL NAME: 1,1,1-trichloro-2,2-bis (p-methoxyphenyl)ethanol

MANUFACTURED BY: E. I. duPont de Nemours & Company, Inc.

TYPE COMPOUND: Chlorinated hydrocarbon

FORMULATIONS: Wettable powders, Emulsifiable Concentrates, Oil solution, Aerosols, and Dusts.

TOXICITY: Acute oral LD_{50}, 6000 mg/kg
Acute dermal LD_{50}, (rat) $>6{,}000$ mg/kg
It is rarely phytotoxic.

GENERAL USE: An insecticide used against many insect pests of agricultural crops, livestock, fruit and shade trees and for mosquito and fly control.

REMARKS: Long residual activity and has low toxicity to warm-blooded animals.

COMMON NAME: methyl bromide

TRADE NAMES: Brom-O-Gas; Meth-O-Gas; Dowfume MC-2; Dowfume MC-33; Profume

CHEMICAL NAME: bromomethane

MANUFACTURED BY: Amer. Pot.; Dow Chemical Co.; Excel Industries Limited (India); Great Lakes Chemical Corp.; Kerr-McGee Chemical Corp.; Michigan Chemical Corp.

TYPE COMPOUND: Fumigant

FORMULATIONS: Packed in glass ampules (up to 50 ml) in 1 lb. tins or metal cylinders for direct use.

TOXICITY: Acute vapor toxicity, 200 ppm

GENERAL USAGE: Used in moderate concentrations for insect control in grain elevators, mills, and ships; has been applied widely in greenhouse fumigation. The gas is a soil fumigant for control of weeds, weed seeds, nematodes, insects, and soil borne diseases. Also used for termite control, agricultural commodity fumigation, and rodent control.

REMARKS: Although methyl bromide has little effect on plant tissues in ordinary concentrations, heavy amounts will kill most plants and seeds.

COMMON NAME: methyl parathion

TRADE NAMES:

CHEMICAL NAME: O,O-dimethyl O-p-nitrophenyl phosphorothioate

MANUFACTURED BY: American Cyanamid Company, Cheminova (Denmark), Farbenfabriken Bayer AG (Germany), Kerr-McGee Chemical Corp., Monsanto Co., Agricultural Div., Stauffer Chemical Co.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable Concentrates, Wettable Powders and Dusts.

TOXICITY: Acute oral LD_{50} (rat), 14 mg/kg
Acute dermal LD_{50} (rat), 67 mg/kg

GENERAL USE: Insecticide. Used for control of many insects of economic importance.

REMARKS:

COMMON NAME: mevinphos

TRADE NAMES: Phosdrin

CHEMICAL NAME: methyl 3-hyroxy-alpha-crotonate, dimethyl phosphate

MANUFACTURED BY: Shell Oil Company

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable Concentrates, Water Soluble Solutions and Dusts

TOXICITY: Acute oral LD_{50} (rat), 6.1 mg/kg
Acute dermal LD_{50} (rat), 4.7 mg/kg

GENERAL USE: Systemic Insecticide and Acaricide. Controls a broad range of insect and mite pests of field crops. Dissipates quickly and may be used close to harvest depending upon crop and dosage.

REMARKS: A highly toxic water-miscible material that should be used only by experienced operators.

COMMON NAME: naled

TRADE NAMES: Dibrom; Bromex

CHEMICAL NAME: 1,2-dibromo-2,2-dichloroethyl dimethyl phosphate

MANUFACTURED BY: Chevron Chemical Co., Ortho Div.; Makhteshim Beer-Sheba Chemical Works, Ltd. (Israel)

TYPE COMPOUND: organophosphorus

FORMULATIONS: Emulsifiable concentrates, dusts

TOXICITY: Acute oral LD_{50} (rat), 430 mg/kg
Acute dermal LD_{50} (rabbit) 1100 mg/kg

GENERAL USAGE: Insecticide-acaricide (non-systemic). Recommended for use on numerous crops, generally up to 4 days of harvest or less; also against flies in barns, poultry houses, & kennels. Also useful for municipal & other large area mosquitoe control by ULV or conventional application methods.

REMARKS: Not approved for use in grain bins.

COMMON NAME: naphthalene

TRADE NAMES:

CHEMICAL NAME: naphthalene

MANUFACTURED BY: Allied

TYPE COMPOUND: Action insecticidal fumigant and repellent

FORMULATIONS: For fumigation, use pure grades free from dust and heat in specially-designed lamps.

TOXICITY: of low toxicity to warm-blooded animals

GENERAL USAGE: Used for the control of clothes moths and carpet beetles. It has been used also as a greenhouse fumigant and against gladiolus thrips. Formulated with other ingredients, it has been sold for application to livestock and poultry as a lice powder.

REMARKS:

nicotine

COMMON NAME: nicotine

TRADE NAMES: Black Leaf 40; nicotine (sulfate)

CHEMICAL NAME: 1,3-(1-Methyl-2-pyrrolidyl) pyridine

MANUFACTURED BY: Canada Rex Spray Co. Ltd., Brighton, Ontario, Canada; Chemical Formulators, Inc.; Rentiss Drug & Chemical Co.

TYPE COMPOUND: botanical derivative (heterocyclic)

FORMULATIONS: Two basic types: nicotine alkaloid & nicotine sulfate

TOXICITY: Acute oral LD_{50} (rat), 50-60 mg/kg
Acute dermal LD_{50} (rat), 285 mg/kg

GENERAL USAGE: Insecticide. Used as a fumigant in greenhouses.

REMARKS: Little or no nicotine is now produced in the U. S.

COMMON NAME: oxydemetonmethyl

TRADE NAMES: Meta-Systox-R

CHEMICAL NAME: S-[2-(ethylsulfinyl)ethyl] O, O-dimethyl phosphorothioate

MANUFACTURED BY: Chemagro Division, Baychem Corp.; Farbenfabriken Bayer AG (Germany).

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Spray concentrate (2 lb./gal);
50% technical (only for special purposes)

TOXICITY: Acute oral LD_{50} (rat), 80 mg. tech/kg.
Acute dermal LD_{50} (male rat), 250 mg/kg

GENERAL USAGE: A systemic insecticide-acaricide. Renders plants toxic to many destructive pests, such as aphids, mites, leafhoppers, leafminers, and whiteflies, when applied to sugar beets, a variety of vegetables, non-bearing fruit trees, and ornamentals.

REMARKS: Highly toxic to honey bees.

COMMON NAME: oxythioquinox

TRADE NAMES: Morestan, Forstan

CHEMICAL NAME: 6-methyl-2,3-quinoxalinedithiol cyclic S, S-dithiocarbonate

MANUFACTURED BY: Chemagro Division, Baychem Corp.; Farbenfabriken Bayer AG (Germany)

TYPE COMPOUND: Heterocyclic carbonate

FORMULATIONS: 25% wettable powder & dust

TOXICITY: Acute oral LD_{50} (rat) 3,000 mg/kg
Acute dermal LD_{50} (rat) 72,000 mg/kg

GENERAL USAGE: Insecticide-acaricide-fungicide. For residual control of mites, mite eggs, powdery mildew and pear psylla. Used as pre-bloom spray on most deciduous fruits and in both pre- and post-bloom sprays on apples and pears.

REMARKS: Morestan is toxic to fish. Do not apply where runoff is likely to occur. In cleaning of equipment or disposal of wastes, do not contaminate streams, lakes or ponds with this material.

parathion

COMMON NAME: parathion, thiophos

TRADE NAMES: Niran, Thiophos, Stathion, Alkron, Alleron, Bladan, Corothion, E-605, Etilon, Folidol E-605, Orthophos, Panthion, Parathene, Parawet, Phoskil, Rhodiatox, Soprathion, Stathion, Thiophos.

CHEMICAL NAME: O,O-diethyl O-p-nitrophenyl phosphorothioate

MANUFACTURED BY: Stauffer Chemical Co.; Cheminova (Denmark); Farbenfabriken Bayer AG (West Germany); Kert-McGee Chemical Corp. Monsanto Co., Agricultural Div.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: emulsifiable concentrates, wettable powders, granules, dusts, aerosols.

TOXICITY: Acute oral LD_{50} (male rat) 13 mg/kg; (female rat) 3.6 mg/kg
Acute dermal LD_{50} (female rat) 6.8 mg/kg

GENERAL USAGE: Insecticide. Wide range of application on many crops against numerous insect species.

REMARKS: Extremely toxic to warm-blooded animals through inhalation and skin absorption.

perthane

COMMON NAME: perthane

TRADE NAMES:

CHEMICAL NAME: 1,1-dichloro-2,2-bis(4-ethylphenyl)ethane

MANUFACTURED BY: Rohm & Haas Co.

TYPE COMPOUND: chlorinated hydrocarbon

FORMULATIONS: Available as 88% active technical, 75% technical solution and 45% emulsifiable concentrate

TOXICITY: Acute oral LD_{50} (rat), 8,170 mg/kg

GENERAL USE: Insecticide used on certain vegetable crops for looper control and pears for the control of pear psylla. Also used in pressurized and oil based sprays for moth and carpet beetle control.

REMARKS:

COMMON NAME: phorate

TRADE NAMES: Thimet; Rampart

CHEMICAL NAME: O,O-diethyl-S-[(ethylthio)methyl] phosphorodithiate

MANUFACTURED BY: American Cyanamide Co.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Granules (10% and 15%)

TOXICITY: Acute oral LD_{50} (male rat), 2-4 mg/kg
Acute dermal LD_{50} (rat) 6.2 mg/kg
Acute dermal LD50 (guinea pig), 630 mg/kg

GENERAL USAGE: A soil and Systemic insecticide. Used to control a wide range of insects on a variety of crops such as alfalfa, barley, beans, corn, lettuce, potatoes, sorghum, sugar beets, tomatoes, wheat and commercially grown ornamentals.

REMARKS: Technical Thimet and its formulations are highly poisonous by skin contact, inhalation or swallowing.

COMMON NAME: phosphamidon

TRADE NAMES: Dimecron

CHEMICAL NAME: 2-chloro-N,N-diethyl-3-(dimethoxyphos phinyloxy) crotonamide
or 2-chloro-2-diethylcarbamoyl-1-methylvinyldimethylphosphate

MANUFACTURED BY: Chevron Chemical Co., Ortho Div.; CIBA-Geigy Limited (Switzerland)

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate 8 pounds active/gallon

TOXICITY: Acute oral LD_{50} (rat) 27.4 mg/kg
Acute dermal LD_{50} (rat) 143 mg/kg

GENERAL USAGE: A plant systemic insecticide. Effective against aphids, mites, beetles, plant bugs.

REMARKS: Highly toxic to honey bees.

COMMON NAME: prophos

TRADE NAMES: Mocap

CHEMICAL NAME: O-ethyl S,S-dipropyl phosphorodithioate

MANUFACTURED BY: Mobil Chemical Co., Industrial Chemicals Div.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: 10% granular; also 4 lb./gal Emulsifiable Concentrate

TOXICITY: Acute oral LD_{50} 61.5 mg/kg;

GENERAL USE: Nematocide soil insecticide. Insecticide-soil application at planting or cultivation time for corn rootworm control. Effective nematocide for control of turf, ornamental and field crop nematodes. Insecticidal activity against such soil pests as wireworms, corn rootworms, and symphylans.

REMARKS:

COMMON NAME: propoxur

TRADE NAMES: Baygon; Blattanex; Sendran; Suncide; Tugon Fliegenkugel; Unden

CHEMICAL NAME: Ø-Isopropoxyphenyl-methylcarbamate

MANUFACTURED BY: Chemagro Div., Baychem Corp.; FFB AG (West Germany)

TYPE COMPOUND: Carbamate

FORMULATIONS: Wettable powder, Spray concentrate, granules, ULV, oil fog concentrate and bait.

TOXICITY: Acute oral LD_{50} (rat), 128 mg/kg
Acute dermal LD_{50} 800-1200 mg/kg

GENERAL USE: Insecticide particularly effective against insects affecting man and animals, such as cockroaches, flies, and mosquitoes where rapid knockdown and residual properties are important, as well as lawn and turf for sod webworm.

REMARKS: Not to be used in animal barns or poultry houses. Toxic to wildlife. Animals must be kept off treated areas until surfaces are dry. Not for use on edible products.

COMMON NAME: pyrethrins

TRADE NAMES: Neopynamin; Synthrin

CHEMICAL NAME: pyrethrum (from plant species Chrysanthemum cenariaefolium)

MANUFACTURED BY: McLaughlin Gormley King Co.

TYPE COMPOUND: botanical alkaloid

FORMULATIONS: Available as a concentrate in oil, usually containing synergists; in impregnated and stabilized dust concentrates.

TOXICITY: Acute oral LD_{50} (rat), 1500 mg/kg.

GENERAL USAGE: An insecticide. Pyrethrum extracts are used extensively in stock sprays, pet sprays, household sprays, and aerosols, industrial sanitation sprays, and to protect stored food in warehouses.

REMARKS: Pyrethrins break down in presence of air so should be used when fresh.

Rabon, Gardona

COMMON NAME:

TRADE NAMES: Rabon, Gardona

CHEMICAL NAME: 2-chloro-1-(2,4,5-trichlorophenyl)vinyl dimethylphosphate

MANUFACTURED BY: Shell Chemical Co.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate, wettable powders and dusts.

TOXICITY: Acute oral LD_{50} (rat), 4,000-5,000 mg/kg
Acute dermal LD_{50} (rat), >5,000 mg/kg

GENERAL USE: For many pests of livestock, as a residual barn spray, for control of stored products pests, fabric pests and tree pests.

REMARKS:

COMMON NAME: ronnel

TRADE NAMES: Korlan; Ronnel; Trolene; Ectoral; Etrolene; Nankor; Viozene; Rid-Ezy

CHEMICAL NAME: O,O-dimethyl O-2,4,5-trizchlorophenyl phosphorothioate

MANUFACTURED BY: Dow Chemical Co.

TYPE COMPOUND: organophosphorus

FORMULATIONS: Emulsifiable concentrate, wettable powder, granules, smears, bolus, pour-on, feed additive.

TOXICITY: Acute oral LD_{50} (rat) 1740 mg/kg
Acute dermal LD_{50} (rat), 75000 mg/kg
Acute dermal LD_{50} (rabbit) 1000-2000 mg/kg

GENERAL USAGE: Used as an animal systemic insecticide for control of numerous livestock pests. Also used as a contact insecticide.

REMARKS: The trade name Trolene is applied to formulations containing drug grade ronnel for oral use; Korlan is applied to formulations containing technical grade ronnel for use as a spray.

rotenone

COMMON NAME: rotenone (also cube or derris)

TRADE NAMES:

CHEMICAL NAME: 1,2,12,12a, tetrahydro-2-isopropenyl-8, 9-dimethoxy-[1] benzopyrano-[3,4-b]furo [2,3-b] [1]benzopyran-6(6aH)one

MANUFACTURED BY: Chem. Ins. Corp.; FMC Corp., Niagara Chemical Div.; S. B. Penick & Co.; Prentiss Drug & Chemical Co.

TYPE COMPOUND: botanical

FORMULATIONS: incorporate the extracts from the rotenone bearing plants cube, derris, or timbo in spray preparations.

TOXICITY: Acute oral LD_{50} (rat) 132 mg/kg

GENERAL USAGE: Insecticide. Long used as dusts for garden insects, lice, and ticks on animals and for cattle grubs. Rotenone is used with pyrethrum and piperonyl butoxide for most rapid action and for control of a wide variety of insects on food crops.

REMARKS: Rotenone is highly toxic to fish.

COMMON NAME: sabadilla

TRADE NAMES:

CHEMICAL NAME: seeds of Schoenocaulon officinale (veratrine alkaloids)

MANUFACTURED BY: Chem. Ins. Corp.; S. B. Penick & Co.; Prentiss Drug & Chemical Co., Inc.

TYPE COMPOUND: botanical insecticide

FORMULATIONS: Kerosene solution; dust 10-20%

TOXICITY: Acute oral LD_{50} (rats) 4000 mg/kg

GENERAL USAGE: Acts primarily as a contact poison. It can be used on food crops and it is less toxic than rotenone when inhaled or ingested.

REMARKS: Relatively non-toxic to warm-blooded animals but irritant to mucous membranes.

COMMON NAME: schradan

TRADE NAMES: OMPA, Pestox III, Sytam

CHEMICAL NAME: Octamethylpyrophosphoramide

MANUFACTURED BY: Murphy Chemical, Ltd. (Great Britian)

TYPE COMPOUND: organophorphorus

FORMULATIONS:

TOXICITY: Acute oral LD_{50} (rat) 9.1 mg/kg
Acute dermal LD_{50} (rat) 15 mg/kg

GENERAL USAGE: Systemic insecticide. Sucking insects are killed as they feed. Used mainly for aphid and mite control. Effective for control of insects on ornamentals and walnuts.

REMARKS: No longer sold in the United States.

sulfur

COMMON NAME: sulfur, brimstone

TRADE NAMES:

CHEMICAL NAME: sulfur

MANUFACTURED BY: CIBA-Geigy, Farbentabriken Bayer AG (West Germany); Sandoz (AG) Switzerland; Stauffer Chemical Co.; Riedel de Haen AG (West Germany); ICI of Australia and New Zealand Limited (Australia) FMC Corp., Niagara Chemical Div.

TYPE COMPOUND:

FORMULATIONS: Formulated as a wettable powder, liquid flowable sulfur or as dusting sulfur.

TOXICITY:

GENERAL USAGE: A fungicide and acaricide. Effective for control of a variety of plant diseases - brown rot of peaches, apple scab, peanut leafspot, mildew on roses, powdery mildew and rusts; fleahoppers and mites.

REMARKS: Sulfur may cause plant injury at summer temperatures.

Supracide

COMMON NAME:

TRADE NAMES: Supracide, Ultracide

CHEMICAL NAME: O,O-dimethyl S-[2-methoxy-1,3,4-thiadiazol-5(4H)onyl-(4)-methyl] dithiophosphate

MANUFACTURED BY: CIBA-Geigy Corp.

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Emulsifiable concentrate

TOXICITY: Acute oral LD_{50} (rat) 65 mg (2EC)/kg.

GENERAL USAGE: An acaricide-insecticide. Active against various spider mite species and insects on both agricultural and horticultural crops.

REMARKS:

COMMON NAME: TDE

TRADE NAMES: Rhothane

CHEMICAL NAME: 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane

MANUFACTURED BY: Allied Chemical Corporation; Rohm and Haas Company

TYPE COMPOUND: Chlorinated hydrocarbon

FORMULATIONS: Wettable powders, emulsifiable concentrates and dusts

TOXICITY: Acute oral LD_{50} (rat), 3400 mg/kg

GENERAL USE: Insecticides formerly used on many fruits and vegetables.

REMARKS: Not now in production.

Telone

COMMON NAME:

TRADE NAMES: Telone

CHEMICAL NAME: 1,3 dichloropropane and 1,2-dichloropropane and related chlorinated hydrocarbons

MANUFACTURED BY: Dow Chemical Co.

TYPE COMPOUND: Chlorinated hydrocarbon

FORMULATIONS: Soil fumigant

TOXICITY: Acute oral LD_{50} (rat), 250-500 mg/kg
Acute vapor toxicity, 500 ppm

GENERAL USAGE: Nematocide (soil fumigant). For all croplands. Controls plant parasitic nematodes.

REMARKS: Very hazardous, wear protective clothing. Lethal if ingested or absorbed by skin.

COMMON NAME: TEPP

TRADE NAMES: Tetron; Vapotone; Kilmite 40

CHEMICAL NAME: tetraethyl pyrophosphate

MANUFACTURED BY: Amer. Potash; Miller Chemical and Fertilizer Corp.

TYPE COMPOUND: organophosphorus

FORMULATIONS: Agricultural mixture 40%
In methyl chloride for "aerosol" use

TOXICITY: Acute oral LD_{50} (rat), 1.2-2.0 mg/kg
Acute dermal LD_{50} (rat), 2.4 mg/kg

GENERAL USAGE: An insecticide-acaricide. A contact poison which has been found very effective against the active stages of mites and other soft bodied insects. Registered on a number of food crops, generally up to three days of harvest.

REMARKS: TEPP is very toxic to warm-blooded animals. It is absorbed quickly through the skin and its vapors are also highly toxic.

COMMON NAME: tetradifon

TRADE NAMES: Tedion; Duphar

CHEMICAL NAME: p-chlorophenyl 2,4,5-trichlorophenyl sulfone

MANUFACTURED BY: FMC; N.V. Philips-Duphar (Netherlands)

TYPE COMPOUND: sulfone

FORMULATIONS: Emulsifiable concentrates, wettable powder, smoke generators.

TOXICITY: Acute oral LD_{50} (rat) 14,700 mg/kg

GENERAL USAGE: An acaracide. Kills mites in all their stages of development. Produces sterility in female mites contacting or feeding on deposit. Used on many species of fruits (including citrus and nuts), vegetables, and ornamentals.

REMARKS:

toxaphene

COMMON NAME: toxaphene, polychlorocamphene (USSR)

TRADE NAMES: Camphechlor; Phenacide; Phenatox; Strobane-T; Toxakil

CHEMICAL NAME: Chlorinated camphene containing 67-69% chlorine

MANUFACTURED BY: Hercules Inc.; Procida (Groupe Roussel Uclaf-France); Sonford Chemical Co.; Tenneco Chemicals, Inc., Intermediates Div.

TYPE COMPOUND: Chlorinated hydrocarbon
Action: insecticide

FORMULATIONS: Emulsifiable concentrates range from 4 to 1b/gal.; oil solutions, 90%; and wettable powders, 40%; dusts, 10% and 20%.

TOXICITY: Acute oral LD_{50} (rat), 69 mg/kg
Acute dermal LD_{50} (rat), 1,075 mg/kg

GENERAL USAGE: Livestock formulations recommended for the control of livestock pests, including hornflies, lice, ticks and sheep-ked. Toxaphene sprays and dips effectively control scab mites or mange on livestock. It is very effective when used in dust, liquid or mixed bait forms for control of grasshoppers, armyworms, and cutworms.

REMARKS: It acts as both a stomach and a contact poison and does not accumulate in animal tissues as much as does DDT.

COMMON NAME: trichlorfon

TRADE NAMES: Dipterex, Dylox, Neguvon, Anthon

CHEMICAL NAME: dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate

MANUFACTURED BY: Chemagro Corporation

TYPE COMPOUND: Organophosphorus

FORMULATIONS: Neguvon: Pour-on
Anthon: Feed Additive
Dipterex: Fly Bait
Dylox: Oil solution, Soluble Powder, and Emulsifiable Concentrates

TOXICITY: Acute Oral LD_{50} (rat), 630 mg/kg
Acute Dermal LD_{50} (rat), 2,000 mg/kg

GENERAL USE: For control of a broad spectrum of insect pests including many vegetable, field crop, ornamental, household and livestock pests.

REMARKS:

Vapam

COMMON NAME:

TRADE NAMES: Vapam; Sistan; Trimaton; VPM; Maposol

CHEMICAL NAME: sodium N-methyidthiocarbamate

MANUFACTURED BY: Stauffer Chemical Co.; Procida (Groupe Roussel Uclaf-France); Plant Protection Ltd., Div. of Imperial Chemical Industries, Ltd. (Great Britian); Fabriek van Chemische Produkten Vondelingen-plaot N.V. (Netherland)

TYPE COMPOUND: Dithiocarbamate

FORMULATIONS: Available as 4 lb/gallon concentrate

TOXICITY: Acute oral LD_{50} (rat), 820 mg/kg

GENERAL USAGE: A soil fungicide, nematocide, herbicide. General purpose soil fumigant. Highly effective in control of weeds and weed seeds, nematodes, and soil fungi. Shows promise against various soil insects.

REMARKS: Do not plant before 21 days after application.

INDEX

Abate . . . . . III-(I)-8

Acar (see chlorobenzilate). . . . . III-(I)-25

Acaraben (see chlorobenzilate). . . . . III-(I)-25

Acarin (see dicofol). . . . . III-(I)-36

acephate. . . . . III-(I)-9

Agritol (see Bacillus thuringiensis). . . . . III-(I)-15

Albit (see dieldrin). . . . . III-(I)-37

aldicarb. . . . . III-(I)-10

aldrin. . . . . III-(I)-11

Aldrite (see aldrin). . . . . III-(I)-11

Aldrosol (see aldrin) . . . . . III-(I)-11

Alkron (see parathion). . . . . III-(I)-68

Alleron (see parathion) . . . . . III-(I)-68

allethrin . . . . . III-(I)-12

Anofex (see DDT). . . . . III-(I)-32

Anthon (see trichlorfon). . . . . III-(I)-87

Antimilace (see metaldehyde). . . . . III-(I)-56

Aracide (see Aramite) . . . . . III-(I)-13

Aramite . . . . . III-(I)-13

Asuntol (see coumaphos) . . . . . III-(I)-27

Atgard (see dichlorvos) . . . . . III-(I)-35

azinphosmethyl. . . . . III-(I)-14

Bacillus thuringiensis. . . . . III-(I)-15

Bakthane (see Bacillus thuringiensis) . . . . . III-(I)-15

Basudin (see diazonon). . . . . III-(I)-34

Baygon (see propoxur) . . . . . III-(I)-73

Baymix (see coumaphos). . . . . III-(I)-27
Belt (see chlordane). . . . . III-(I)-24
Benzahex (see benzene hexachloride) . . . . . III-(I)-16
benzene hexachloride. . . . . III-(I)-16
Benzex (see benzene hexachloride) . . . . . III-(I)-16
Benzilan (see chlorobenzilate). . . . . III-(I)-25
BHC (see benzene hexachloride). . . . . III-(I)-16
Biothion (see Abate). . . . . III-(I)-8
Biotrol (see Bacillus thuringiensis). . . . . III-(I)-15
Black Leaf 40 (see nicotine). . . . . III-(I)-65
Bladan (see parathion). . . . . III-(I)-68
Blattanex (see propoxur). . . . . III-(I)-73
brimstone (see sulfur). . . . . III-(I)-80
Bromex (see naled) . . . . . III-(I)-63
Bromofume (see ethylene dibromide). . . . . III-(I)-46
Brom-O-Gas (see methyl bromide) . . . . . III-(I)-60
Bux . . . . . III-(I)-17
Calcium Cyanide . . . . . III-(I)-18
camphechlor (see toxaphene) . . . . . III-(I)-86
carbaryl. . . . . III-(I)-19
carbofos (see malathion). . . . . III-(I)-54
carbofuran. . . . . III-(I)-20
carbon disulfide. . . . . III-(I)-21
carbon tetrachloride. . . . . III-(I)-22
carbophenothion . . . . . III-(I)-23
Carfene (see azinphosmethyl). . . . . III-(I)-14
chlordane . . . . . III-(I)-24
Chlor Kil (see chlordane) . . . . . III-(I)-24

chlorobenzilate . . . . . III-(I)-25
Chlorophenothane (see DDT). . . . . III-(I)-32
chlorpyrifos. . . . . III-(I)-26
Ciodrin (see crotoxphos). . . . . III-(I)-29
Co-Ral (see coumaphos). . . . . III-(I)-27
Corodane (see chlordane). . . . . III-(I)-24
Corothion (see parathion) . . . . . III-(I)-68
coumaphos . . . . . III-(I)-27
creosote oil. . . . . III-(I)-28
crotoxyphos . . . . . III-(I)-29
crufomate . . . . . III-(I)-30
Cyanogas (see Calcium Cyanide). . . . . III-(I)-18
Cyclodan (see endosulfan) . . . . . III-(I)-42
Cygon (see dimethoate). . . . . III-(I)-38
Cythion (see malathion) . . . . . III-(I)-54
Dagadip (see carbophenothion) . . . . . III-(I)-23
Daphene (see dimethoate). . . . . III-(I)-38
Dasanit (see fensulfothion) . . . . . III-(I)-49
Dazzel (see diazinon) . . . . . III-(I)-34
DBCP. . . . . III-(I)-31
DDT . . . . . III-(I)-32
DDVP (see dichlorvos) . . . . . III-(I)-35
Dedelo (see DDT). . . . . III-(I)-32
Dedevap (see dichlorvos). . . . . III-(I)-35
Defend (see dimethoate) . . . . . III-(I)-38
Delnav (see dioxathion) . . . . . III-(I)-39
demeton . . . . . III-(I)-33
Diazajet (see diazinon) . . . . . III-(I)-34

Diazide (diazinon). . . . . III-(I)-34
diazinon. . . . . III-(I)-34
Diazol (see diazinon) . . . . . III-(I)-34
Dibrom (see naled). . . . . III-(I)-63
dichlorvos. . . . . III-(I)-35
dicofol . . . . . III-(I)-36
dieldrin. . . . . III-(I)-37
Dieldrite (see dieldrin). . . . . III-(I)-37
Dimecron (see phosphamidon) . . . . . III-(I)-71
dimethoate. . . . . III-(I)-38
Dimethogens (see dimethoate). . . . . III-(I)-38
dioxathion. . . . . III-(I)-39
Dipel (see Bacillus thuringiensis). . . . . III-(I)-15
Dipterex (see trichlorfon). . . . . III-(I)-87
disulfoton. . . . . III-(I)-40
Di-Syston (see disulfoton). . . . . III-(I)-40
Divipan (see dichlorvos). . . . . III-(I)-35
Dol (see benzene hexachloride). . . . . III-(I)-16
Dolmix (see benzene hexachloride) . . . . . III-(I)-16
Dowfume MC-2 (see methyl bromide) . . . . . III-(I)-60
Dowfume MC-33 (see methyl bromide). . . . . III-(I)-60
Dowfume W-85 (see ethylene dibromide) . . . . . III-(I)-46
Drinox (see aldrin) . . . . . III-(I)-11
Drinox H-34 (see heptachlor). . . . . III-(I)-50
Duphar (see tetradifon) . . . . . III-(I)-85
Dursban (see chlorpyrifos). . . . . III-(I)-26
Dyfonate. . . . . III-(I)-41
Dylox (see trichlorfon) . . . . . III-(I)-87

E-605 (see parathion) . . . . . III-(I)-68
Ectoral (see ronnel) . . . . . III-(I)-76
Emmatos (see malathion) . . . . . III-(I)-54
Emmatos Extra (see malathion) . . . . . III-(I)-54
endosulfan . . . . . III-(I)-42
endrin . . . . . III-(I)-43
EPN . . . . . III-(I)-44
Equigard (see dichlorvos) . . . . . III-(I)-35
ethion . . . . . III-(I)-45
Ethodan (see ethion) . . . . . III-(I)-45
ethylene dibromide . . . . . III-(I)-46
ethylene dichloride . . . . . III-(I)-47
ethylene oxide . . . . . III-(I)-48
Etilon (see parathion) . . . . . III-(I)-68
Etrolene (see ronnel) . . . . . III-(I)-76
FBHC (see benzene hexachloride) . . . . . III-(I)-16
fensulfothion . . . . . III-(I)-49
Folbex (see chlorobenzilate) . . . . . III-(I)-25
Folidol E-605 (see parathion) . . . . . III-(I)-68
Forstan (see oxythioquinox) . . . . . III-(I)-67
Fostion MM (see dimethoate) . . . . . III-(I)-38
Frumin Al (see disulfoton) . . . . . III-(I)-40
Fumazone (see DBCP) . . . . . III-(I)-3
Furadan (see carbofuran) . . . . . III-(I)-2
Gardentox (see diazinon) . . . . . III-(I)-34
Gardona (see Rabon) . . . . . III-(I)-75
Garrathion (see carbophenothion) . . . . . III-(I)-23
Genitox (see DDT) . . . . . III-(I)-32

Gesapon (see DDT) . . . . . III-(I)-32
Gesarex (see DDT) . . . . . III-(I)-32
Gesarol (see DDT) . . . . . III-(I)-32
Gusathion (see azinphosmethyl) . . . . . III-(I)-14
Guthion (see azinphosmethyl) . . . . . III-(I)-14
GX-118 (for livestock, see Imidan) . . . . . III-(I)-51
Gyron (see DDT) . . . . . III-(I)-32
heptachlor . . . . . III-(I)-50
Heptamul (see heptachlor) . . . . . III-(I)-50
Hercules AC 528 (see dioxathion) . . . . . III-(I)-39
Herkol (see dichlorvos) . . . . . III-(I)-35
Hexafor (see benzene hexachloride) . . . . . III-(I)-16
Hexavin (see carbaryl) . . . . . III-(I)-19
Hoe2671 (see endosulfan) . . . . . III-(I)-42
Imidan (for plants) . . . . . III-(I)-51
Insectophene (see endosulfan) . . . . . III-(I)-42
Ixodex (see DDT) . . . . . III-(I)-32
Karbaspray (see carbaryl) . . . . . III-(I)-19
Kelthane (see dicofol) . . . . . III-(I)-36
Kilmite 40 (see TEPP) . . . . . III-(I)-84
Kopfume (see ethylene dibromide) . . . . . III-(I)-46
Kop-Mite (see chlorobenzilate) . . . . . III-(I)-25
Kopsol (see DDT) . . . . . III-(I)-32
Kop-Thiodan (see endosulfan) . . . . . III-(I)-42
Kop-Thion (see malathion) . . . . . III-(I)-54
Korbofos (see malathion) . . . . . III-(I)-54
Korlan (see ronnel) . . . . . III-(I)-76
Kwit (see ethion) . . . . . III-(I)-45

Kypchlor (see chlordane). . . . . III-(I)-24
Kypfos (see malathion). . . . . III-(I)-54
Lannate (see methomyl). . . . . III-(I)-58
Larvatrol (see Bacillus thuringiensis). . . . . III-(I)-15
lead arsenate . . . . . III-(I)-52
lethane 384 . . . . . III-(I)-53
Mafu (see dichlorvos) . . . . . III-(I)-35
Malamar (see malathion) . . . . . III-(I)-54
Malaspray (see malathion) . . . . . III-(I)-54
malathion . . . . . III-(I)-54
Malathon (see malathion). . . . . III-(I)-54
Malix (see endosulfan). . . . . III-(I)-42
Maposol (see Vapam) . . . . . III-(I)-88
Marlate (see methoxychlor). . . . . III-(I)-59
Marvex (see dichlorvos) . . . . . III-(I)-35
Meldane (see coumaphos) . . . . . III-(I)-27
Mercaptodimethur (see Mesurol). . . . . III-(I)-55
mercaptothion (see malathion) . . . . . III-(I)-54
Mesurol . . . . . III-(I)-55
metaldehyde . . . . . III-(I)-56
Meta-Systox-R (see oxdemetonmethyl) . . . . . III-(I)-66
methamidophos . . . . . III-(I)-57
Methiocarb (see Mesurol). . . . . III-(I)-55
Meth-O-Gas (see methyl bromide) . . . . . III-(I)-60
methomyl. . . . . III-(I)-58
methoxychlor. . . . . III-(I)-59
methyl bromide. . . . . III-(I)-60
methyl parathion. . . . . III-(I)-61

Metmercapturon (see Mesurol). . . . . III-(I)-55
mevinphos . . . . . III-(I)-62
Mitigan (see dicofol) . . . . . III-(I)-36
Mocap (see prophos) . . . . . III-(I)-72
Monitor (see methamidophos) . . . . . III-(I)-57
Morestan (see oxythioquinox). . . . . III-(I)-67
Moxie (see methoxychlor). . . . . III-(I)-59
Muscatox (see coumaphos). . . . . III-(I)-27
naled . . . . . III-(I)-63
Nankor (see ronnel) . . . . . III-(I)-76
naphthalene . . . . . III-(I)-64
Navadel (see dioxathion). . . . . III-(I)-39
Navan (see dichlorvos). . . . . III-(I)-35
Neguvon (see trichlorfon) . . . . . III-(I)-87
Nemafume (see DBCP) . . . . . III-(I)-31
Nemagon (see DBCP). . . . . III-(I)-31
Neocid (see DDT). . . . . III-(I)-32
Neopynamin (see pyrethrins) . . . . . III-(I)-74
Nephis (see ethylene dibromide) . . . . . III-(I)-46
Niagaramite (see Aramite) . . . . . III-(I)-13
nicotine. . . . . III-(I)-65
nicotine (sulfate) (see nicotine) . . . . . III-(I)-65
Niran (see parathion) . . . . . III-(I)-68
Nogos (see dichlorvos). . . . . III-(I)-35
No-Pest (see dichlorvos). . . . . III-(I)-35
Octachlor (see chlordane) . . . . . III-(I)-24
Octalene (see aldrin) . . . . . III-(I)-11
Octalox (see dieldrin). . . . . III-(I)-37

Oko (see dichlorvos). . . . . III-(I)-35
OMPA (see schradan) . . . . . III-(I)-79
Orthene (see acephate). . . . . III-(I)-9
Ortho-Klor (see chlordane). . . . . III-(I)-24
Orthophos (see parathion) . . . . . III-(I)-68
oxdemetonmethyl . . . . . III-(I)-66
oxythioquinox . . . . . III-(I)-67
pallethrine (see allethrin) . . . . . III-(I)-12
Panoram D-31 (see dieldrin) . . . . . III-(I)-37
Panthion (see parathion). . . . . III-(I)-68
Parathene (see parathion) . . . . . III-(I)-68
parathion . . . . . III-(I)-68
Parawet (see parathion) . . . . . III-(I)-68
Pentachlorin (see DDT). . . . . III-(I)-32
Perfekthion (see dimethoate). . . . . III-(I)-38
perthane. . . . . III-(I)-69
Pestmaster (see ethylene dibromide) . . . . . III-(I)-46
Pestox III (see schradan) . . . . . III-(I)-79
Phenacide (see toxaphene) . . . . . III-(I)-86
Phenatox (see toxaphene). . . . . III-(I)-86
phorate . . . . . III-(I)-70
Phosdrin (see mevinphos). . . . . III-(I)-62
Phoskil (see parathion) . . . . . III-(I)-68
phosphamidon. . . . . III-(I)-71
Phosvit (see dichlorvos). . . . . III-(I)-35
polychlorocamphene (see toxaphene). . . . . III-(I)-86
Profume (see methyl bromide). . . . . III-(I)-60
Prolate (see Imidan). . . . . III-(I)-51

prophos . . . . . III-(I)-72
propoxur. . . . . III-(I)-73
Pynomin (see allethrin) . . . . . III-(I)-12
pyrethrins. . . . . III-(I)-74
Rabon . . . . . III-(I)-75
Rampart (see phorate) . . . . . III-(I)-70
Ravyon (see carbaryl) . . . . . III-(I)-19
Rebelate (see dimethoate) . . . . . III-(I)-38
Resistox (see coumaphos). . . . . III-(I)-27
Rhodiatox (see parathion) . . . . . III-(I)-68
Rhothane (see TDE). . . . . III-(I)-82
Rid-Ezy (see ronnel). . . . . III-(I)-76
Rogor (see dimethoate). . . . . III-(I)-38
ronnel. . . . . III-(I)-76
Ronnel (see ronnel) . . . . . III-(I)-76
rotenone. . . . . III-(I)-77
Roxion (see dimethoate) . . . . . III-(I)-38
Ruelene (see crufomate) . . . . . III-(I)-30
Rukseam (see DDT) . . . . . III-(I)-32
Ruphos (see dioxathion) . . . . . III-(I)-39
sabadilla . . . . . III-(I)-78
schradan. . . . . III-(I)-79
Seedrin (see aldrin). . . . . III-(I)-11
Sendran (see propoxur). . . . . III-(I)-73
Septene (see carbaryl). . . . . III-(I)-19
Sevin (see carbaryl). . . . . III-(I)-19
Sistan (see Vapam). . . . . III-(I)-88
Soilbrom - 86 (see ethylene dibromide). . . . . III-(I)-46

Solvirex (see disulfoton) . . . . . III-(I)-40
Soprabel (see lead arsenate). . . . . III-(I)-52
Soprathion (see parathion). . . . . III-(I)-68
Soprocide (see benzene hexachloride). . . . . III-(I)-16
Spectracide (see diazinon). . . . . III-(I)-34
Stathion (see parathion). . . . . III-(I)-68
Strobane-T (see toxaphene). . . . . III-(I)-86
sulfur. . . . . III-(I)-80
Suncide (see propoxur). . . . . III-(I)-73
Supracide . . . . . III-(I)-81
Synklor (see chlordane) . . . . . III-(I)-24
Synthrin (see pyrethrins) . . . . . III-(I)-74
Systemox (see demeton). . . . . III-(I)-33
Systox (see demeton). . . . . III-(I)-33
Sytam (see schradan). . . . . III-(I)-79
Tamaron (see methamidophos) . . . . . III-(I)-57
Task (see dichlorvos) . . . . . III-(I)-35
TDE . . . . . III-(I)-82
Tedion (see tetradifon) . . . . . III-(I)-85
Telone. . . . . III-(I)-83
Temik (see aldicarb). . . . . III-(I)-10
TEPP. . . . . III-(I)-84
Terracur P (see fensulfothion). . . . . III-(I)-49
tetradifon. . . . . III-(I)-85
Tetron (see TEPP) . . . . . III-(I)-84
Thifor (see endosulfan) . . . . . III-(I)-42
Thimet (see phorate). . . . . III-(I)-70
Thimul (see endosulfan) . . . . . III-(I)-42

Thiodan (see endosulfan). . . . . III-(I)-42
Thionex (see endosulfan). . . . . III-(I)-42
Thiophos (see parathion). . . . . III-(I)-68
Thuricide (see Bacillus thuringiensis). . . . . III-(I)-15
Thuricide 90 TS (see Bacillus thuringiensis). . . . . III-(I)-15
Topiclor 20 (see chlordane) . . . . . III-(I)-24
Toxakil (see toxaphene) . . . . . III-(I)-86
toxaphene . . . . . III-(I)-86
Tribactur (see Bacillus thuringiensis). . . . . III-(I)-15
Tricarna (see carbaryl) . . . . . III-(I)-19
trichlorfon . . . . . III-(I)-87
Trimaton (see Vapam). . . . . III-(I)-88
Trimetion (see dimethoate). . . . . III-(I)-38
Trithion (see carbophenothion). . . . . III-(I)-23
Trolene (see ronnel). . . . . III-(I)-76
Tugon Fliegenkugel (see propoxur) . . . . . III-(I)-73
Ultracide (see Supracide) . . . . . III-(I)-81
Unden (see propoxur). . . . . III-(I)-73
Vapam . . . . . III-(I)-88
Vapona (see dichlorvos) . . . . . III-(I)-35
Vapotone (see TEPP) . . . . . III-(I)-84
Velsicol 1068 (see chlordane) . . . . . III-(I)-24
Viozene (see ronnel). . . . . III-(I)-76
VPM (see Vapam) . . . . . III-(I)-88
Zerdane (see DDT) . . . . . III-(I)-32
Zithiol (see malathion) . . . . . III-(I)-54